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Palatini kinetic scalar-tensor theory: analytical and numerical solutions

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We discuss different types of solutions (globally regular, black holes, wormholes and cosmological solutions), in the framework of the new two-parameter Palatini scalar-tensor theory with the derivative coupling of a scalar to the Ricci tensor. The metric version of the theory for generic values of two coupling constants is ghostly, but in Palatini version it is ghost-free. The theory admits an Einstein's frame with a non-canonical scalar field, and its one-parameter subfamily is reduced to the minimal Einstein-scalar theory in this frame Some analytical solutions can be constructed using disformal transformations from the Einstein frame. Usually, the singular solutions of Einstein-scalar gravity transform into non-singular solutions in the Jordan frame due to the strong violation of the NEC in this theory. We construct numerical solutions describing various alternatives to the static metrics of ultracompact objects, including solutions with non-singular centers and wormholes. Cosmological solutions, both analytical and numerical, typically exhibit genesis-type behavior.

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